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## DEVELOPMENT AND STUDY OF ALKALI-ACTIVATED CEMENTS AND CONCRETE BASED ON THEM USING CHPASH

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### Annotation

The possibilities of developing a resource-saving technology for the production of concrete mixtures using cullet as a coarse aggregate for the manufacture of monolithic floors are considered. The ways of using cullet as a material for construction, the prospects for its use as a filler for concrete have been studied. It is shown that cullet, the density of which is lower than the density of traditional aggregates, can serve as an excellent raw material and act as a concrete aggregate, as well as help reduce the cost of extracting natural resources and reduce energy for their processing.

**Keywords:** glass, glass concrete, glass waste, filler, properties.

### INTRODUCTION

Currently, one of the promising areas is the development of energy-saving technologies, in which secondary raw materials are used instead of primary ones. This makes it possible to reduce the amount of waste in the environment and involve them in the resource cycle, while reducing the volume of use of primary natural resources.

Glass waste is one of the main ones. They are a hard-to-recycle material with a different dispersed composition, which is practically not reused.

### MATERIALS AND METHODS

In construction, concrete can be used both in any structures, load-bearing and self-supporting, and in decorative and finishing products. Currently, the turnover of concrete is declining due to the crisis, pandemic and lack of resources. The question arises of introducing new energy-saving technologies that will increase production volumes and reduce the need for primary natural resources.



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Cullet can be used not only in the production of glass containers, but also in the production of building materials, including heat-insulating ones (glass expanded clay, glass blocks, foam glass, cellular concrete) [1–3].

### RESULTS AND DISCUSSION

The resource base of unsorted cullet of technical glass seems to be very significant for the production of building materials, including the production of concrete mix with cullet aggregate.

Enterprises producing building materials, products and structures can act as potential consumers of cullet.

Broken glass is used in road construction as part of asphalt concrete or the so-called glassfalt (from English glass - glass, asphalt - asphalt) [1]. Cullet is used as a filler in the production of road and sidewalk coatings [2], as well as to obtain glass microballoons, which can be used, among other things, in the manufacture of retroreflective devices for roads [3].

There is a known method for the production of plates to protect and prevent accidental damage to electrical cables laid in trenches, in which waste in the form of broken ground glass is used as a filler [4].

In Western countries, new materials based on cullet are also being created. In America, white and colored bricks made from cullet and waste paper were invented, as well as the material tixit, obtained from crushed cullet, building rubble stone and clay. In the UK, it is known to use cullet as a material or basis for drainage for multilayer structures within the carriageway of a highway [1].

Articles [4] provide examples of how the use of secondary raw materials helps to reduce the cost of extracting and processing the necessary resources. Firstly, waste is used 2–3 times cheaper than natural raw materials, and secondly, energy consumption is reduced by 10–40%.

Studies [1] have shown that each ton of recycled glass saves more than a ton of natural raw materials, including about 650 kg of sand, 186 kg of soda and about 200 kg of limestone; these savings apply to the entire raw material chain, including the extraction of raw materials and their transportation. The authors of the article [2] faced the problem of recycling cullet in our country. It lies in the disorganization of the collection of cullet glass, the complexity and laboriousness of the process of collecting, cleaning, sorting glass raw materials.



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The article [1] emphasizes that the use of cullet makes it possible to obtain concretes with characteristics that are superior in strength to ordinary concretes on sand aggregate. Such an increase in strength will be achieved due to the surface crystallization of coarse aggregate. In addition, the article [3] refers to the possibility of using finely dispersed glass, but already in the form of a binder or with further processing into foam glass. It has been experimentally established that it is not advisable to use small and large fractions of glass due to the greater likelihood of a silicate-alkaline reaction, but it can be suppressed with the help of additives or by preliminary heat treatment.

In the article [4], the authors used an active mineral additive having an acidic character, which led to a decrease in the basicity of the binder and a decrease in the activity of alkali due to the chemical absorption of the latter by the active components of the mixed binder. The hydraulically active components of the mixed binder are amorphous silica of zeolite-containing rock and glass phase of CHP ash.

### CONCLUSION

The optimal use of glass waste is to use it as aggregate for concrete. The most effective application is coarse aggregate or raw material for processing into foam glass. These options do not require additional measures against silicate corrosion. However, it is possible to use cullet as a fine, medium and large aggregate, but with the use of special additives that prevent the occurrence of alkali-silicate corrosion, or subject the aggregate to heat treatment.

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